

REMARKS

Claims 1-73 remain pending, wherein claims 1, 31, 32, 36, 37 43, 45, 67-69, 71 and 73 have been amended. Favorable reconsideration is respectfully requested.

Each of independent apparatus claims 1 and 37 have been amended to recite that the array of antenna elements is for receiving RF signals, that the antenna array includes a center antenna and a group of antenna elements surrounding the center antenna, that the center antenna is adjusted to the same phase shift for each of the reception lobes to maintain a phase center for the array of antenna elements. Similar changes have been made to method claims 31 and 67 with respect to a steps of receiving a RF signals, determining pointing vectors, receiving RF signals using an antenna array having a center antenna and maintaining a phase center for the antenna. The remaining amendments to the independent claims include changes to improve readability and, in some instances, to broaden the claims in some respects. Dependent claims 32, 36, 43, 68, 69, 71 and 73 have been amended to conform to the changes made in their respective parent claims. Support for the amendments can be found throughout the original disclosure, for example, in the specification at ¶ 38, lines 1-2, ¶ 42, lines 4-6, ¶ 46, line 1-3, ¶ 47, lines 1-3, ¶ 54, ¶ 56, ¶ 60, lines 1-6, ¶ 61, ¶ 0069 and Figure 8.

The Office Action includes rejections claims 1-73 under 35 U.S.C. §103, as allegedly being obvious over combination of U.S. Patent No. 6,377,211 to Hsiung and U.S. Patent No. 5,917,446 to Greenspan, and the combination of U.S. Patent No. 6,023,242 to Dixon patent in combination with the Greenspan patent. To the extent that the Office may consider the rejection to apply the amended independent claims, the rejection is respectfully traversed.

Claim 1, as amended, recites an apparatus for selectively receiving radio frequency (RF) signals. To receive RF signals, the apparatus includes an array of antenna elements having a center antenna and a group of antenna elements surrounding the center antenna. The apparatus includes a navigational controller for determining pointing vectors from coordinate information, and beam-forming electronics connected to the array of antenna elements and the navigational controller for forming a reception lobe in the direction of

each source of the RF signals. A phase center for the array of antenna elements is maintained by adjusting the center antenna to a same phase shift for each of the reception lobes.

Amended claim 31 is directed to a method for selectively receiving radio frequency (RF) signals radiated from a plurality of RF signal sources. The claimed method includes the steps of receiving the RF signals using an array of antenna elements including a center antenna and a group of antenna elements surrounding said center antenna, determining pointing vectors from coordinate information, each pointing vector corresponding to one of the RF signal sources, and forming a reception lobes lobe in the direction of each pointing vector. The method further recites that the center antenna is adjusted to a same phase shift for each reception lobe to maintain a phase center for the array of antenna elements.

For example, as shown in Figure 1 and described in Applicant's specification starting at page 8, an apparatus 100 for selectively receiving RF signals includes an antenna array 101, beam forming electronics 103, and a navigational controller 105. The antenna array 101 of apparatus 100 comprises a plurality of antenna elements 201 for receiving the RF signals. (See Figure 2 and Applicant's specification, ¶¶ 0036-0041.) An exemplary navigation controller 105, as shown with more detail in Figure 4 and described on page 13, ¶ 0048 of Applicant's specification, can include a receiver 401 for receiving RF signal transmissions that convey absolute position information of the apparatus and a navigation processor 405 for calculating a pointing vector based on coordinate information. For example, as described on page 14 of the specification, a receiver 401 (e.g., a GPS receiver) can transmit position information, in the form of pseudo and delta range information 407 (i.e., absolute position information), to the navigation processor 405. Based upon the position information 407, the navigation processor 405 is able to determine the location of a source transmitters of RF signals (e.g., a GPS satellites), and create pointing vectors 309, which indicate the direction of the source transmitters, to allow the beam-forming algorithm processor 305 to create reception lobes in the direction of each source of the RF signals. (See Figure 3, and the specification, ¶¶ 0042-0047.)

As described in ¶ 0069 of the specification, the antenna array can include a center antenna that is adjusted to the same phase shift for each of the lobes to maintain a phase

center for the antenna array. For example, a center antenna element can be contained within a patch of surrounding antenna elements. By maintaining a constant phase center during beamforming, accurate and precise carrier phase measurements can be made. A fixed antenna phase center can therefore provide for higher quality RF input to a receiver. High quality input allows for optimum signal detection, signal correlation, and thus improvements in carrier to noise ratio. These increased capabilities also lead to enhancements in the receiver's capacity to operate in code phase mode or carrier phase mode, enhanced common mode rejection, and more accurate velocity output. The present invention also improves system performance as a result of the increase in received RF signal power, which enhances multipath rejection, and the constant antenna phase center, which provides a fixed lever arm geometry. Both of these features are essential for precision navigation and control.

By contrast, neither Dixon nor Greenspan include any mention of an "array including a center antenna and a group of antenna elements surrounding the center antenna," and that "a phase center for the array of antenna elements antenna is maintained by adjusting the center antenna to a same phase shift for each of the reception lobes," as set forth in independent claim 1, and as similarly in each of independent claims 31, 37 and 67.

Even if one were to consider a combination of these documents, it is respectfully submitted that there would not have been any teaching or suggestion of an antenna array having a center antenna and maintaining a phase center for the array by adjusting the center antenna to a same phase shift for each of the reception lobes as claimed. Dixon and Greenspan simply are not concerned with problems related to phase center variation and ways in which such variations can be avoided.

Hence, the combination of Dixon and Greenspan fail to teach or suggest each and every feature of the claimed combination of features set forth in amended claims 1, 31, 37 and 67. As such no *prima facie* case of obviousness exists in Dixon and Greenspan. Accordingly independent claims 1, 31, 37 and 67 are patentable over these documents. Dependent claims 2-30, 32-36, 38-66 and 68-73 are patentable at least for the reasons given above with respect to their parent claims, and for the combinations of additional features recited.

With respect to the rejection involving the Hsiung patent, Applicants hereby assert that both the Hsiung patent and the present application were subject to an obligation of assignment to Lockheed Martin Corporation at the time of filing the present application. Furthermore the Hsiung patent qualifies as a reference available under section 102(e) because it is a patent that was granted on an application for patent by another filed in the United States before the filing date of present application, and the Hsiung patent is not prior art under Sections 102(a) and 102(b) because Hsiung was not patented before the invention thereof for patent by Applicants.

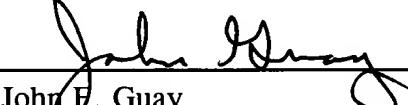
In view of the foregoing, Applicants assert that the Hsiung patent constitutes subject matter as defined under Section 103(c) and therefore should be excluded as prior art under Section 103(a). Therefore, the rejection based on the Hsiung document should be withdrawn.

For all the foregoing reasons, Applicants respectfully submit that the present application is in condition for allowance and a notice to that effect is earnestly solicited. Should the Examiner have any questions regarding this response or the application in general, he is urged to contact the undersigned.

Respectfully submitted,

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